

December 7, 2010

Mr. Brian Sullivan, Town Manager
Town of Arlington
730 Mass. Ave.
Arlington, MA 02476

Re: 2010 Year End Report - Aquatic Management Program at Spy Pond – Arlington, MA

In 2010 a non-native plant management program using Sonar AS (fluridone) herbicide and AquaPro (glyphosate) herbicide was conducted at Spy Pond to control growth of non-native, invasive Eurasian watermilfoil (*Myriophyllum spicatum*) and common reed (*Phragmites australis*). The Year End Report for the 2010 Management Program follows. This report will serve to document the herbicide application process, the post-treatment monitoring of aquatic vegetation in the waterbody and the observed response of the targeted weeds. Attached to this report is supporting documentation that further helps to explain the project and the observed results.

All work performed at Spy Pond in 2010 was conducted in accordance with the Order of Conditions (OOC) issued by the Arlington Conservation Commission and the License to Apply Chemicals issued by the MA DEP – Office of Watershed Management (DEP # 100-57). Management plans were also reviewed by the MA Department of Fisheries and Wildlife and approved with conditions under the Natural Heritage and Endangered Species Program.

A chronology of this past year's management and brief description of events follows.

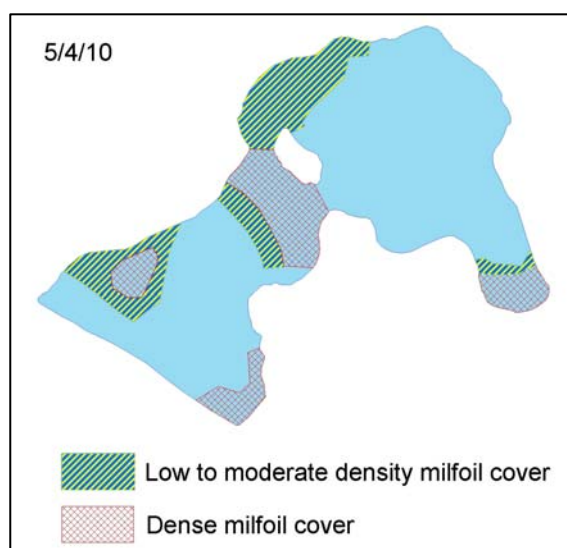
2010 Program Chronology:

- DEP License to Apply Chemicals Issued4/28/10
- Early Season Vegetation Survey 5/4/10
- Cursory Pre-Treatment Survey5/21/10
- Initial Sonar AS application..... 6/1/10
- FasTEST Immunoassay samples collected6/11, 6/29 & 7/28/10
- Follow-up “booster” application of Sonar AS..... 7/7/10
- Post-Treatment Inspections 6/28 & 8/5/10
- Late Season Survey9/15/10
- Treatment of *Phragmites*..... 10/12/10

Pre-treatment Survey:

An Early Season Vegetation Survey was conducted on May 4th to document pre-treatment vegetation composition and confirm the extent of the proposed treatment area. During the survey the entire littoral area of the waterbody was toured and the extent of the milfoil infestation was marked with GPS. The presence of other aquatic plant species was also documented and general observations regarding distribution of species type, species density and species location were collected. An AquaVu underwater camera and plant collection with a throw-rake were used to assist in the identification of vegetation and the determination of the milfoil boundary. A temperature/dissolved oxygen profile was also collected along with a Secchi disk clarity measurement (results attached).

- The large littoral area of Spy Pond supported moderate to dense cover (40%-90%) of aquatic plants, primarily Eurasian watermilfoil, sago pondweed (*Stuckenia pectinatus*) and curlyleaf pondweed (*Potamogeton crispus*).
- Growth of milfoil and sago pondweed was immature and generally 2-3 feet tall.
- Curlyleaf pondweed was more advanced and was at, or near, the surface where found.
- Distribution of dense milfoil growth was reduced some by comparison to pre-treatment conditions in 2009 and was confined primarily to constricted portion of South Basin west of Elizabeth Island and to the shallow and historically infested coves (see figure right)
- Distribution of low density milfoil growth was also reduced from 2009
- Scattered occurrences of thin-leaf pondweed, coontail (*Ceratophyllum demersum*) (*Potamogeton pusillus*), claspingleaf pondweed (*Potamogeton perfoliatus*) and waterweed (*Elodea canadensis*) were also recorded.
- The substrate from the immediate shoreline to depths of ~3 feet is generally a mixture of sand and gravel and does not support dense growth of aquatic plant species.
- Water clarity was fairly high with a Secchi disk reading of 13.6 feet.
- Water temperatures ranged widely between 18.8°C (~66°F) and 8.4°C (~47°F) at the surface and at 7 meters, respectively (average = 13.8 °C)
- The thermocline was fairly undefined but beginning to establish at about 1 meter in depth
- Dissolved oxygen was good with an average concentration of 11.1 mg/L to 7 meters. (approximately 110% saturation)



Based on the stage of milfoil growth observed during the early season survey a second survey was scheduled so treatment could be initiated when the milfoil was most actively growing. The second pre-treatment survey was conducted on 5/21/10.

- By the time of the second survey milfoil growth had advanced significantly.
- Milfoil was 4-6 feet tall with bright green tips indicative of accelerated growth.
- Curlyleaf pondweed growth was less apparent and appeared to have been overtaken by milfoil and sago pondweed.
- Water clarity remained high with a Secchi disk reading of 15.0 feet.
- Water temperatures ranged between 18.9°C (~66°F) and 8.1°C (~47°F) at the surface and at 8 meters, respectively (average = 14.8 °C)

- The thermocline was establishing and had moved to approximately 4 meters in depth
- Dissolved oxygen remained good throughout the water column with an average concentration of 8.8 mg/L to 8 meters. (approximately 85% saturation)

Fluridone (Sonar AS) Treatment

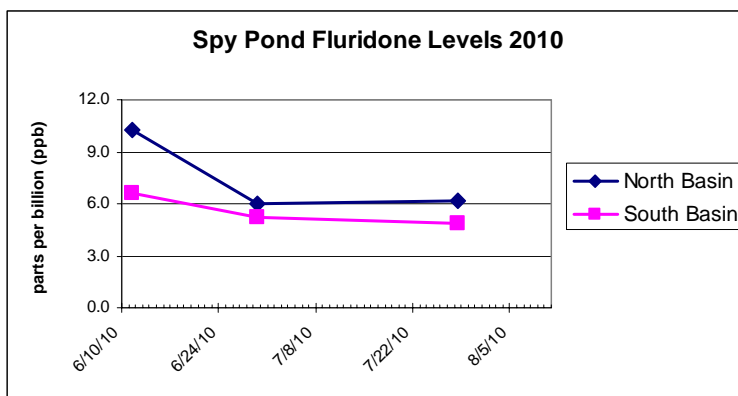
The Sonar AS application at Spy Pond was scheduled for June 1st. Prior to treatment printed signs that warned of the temporary water use restrictions to be imposed following treatment were also posted around the lake prior to treatment. Pre-treatment notifications were also submitted to a local newspaper(s) for publication and to the Arlington Conservation Commission.

An 18 foot airboat equipped with a low pressure pump and calibrated spraying system was used for the treatment. The North and South Basins of the pond were treated individually with the calculated dosage of Sonar herbicide. Application targeted a lake-wide treatment concentration of 10ppb; rates were based on water volume calculations for each Basin. The liquid Sonar herbicide was diluted with pond water in an on-board mixing tank and injected subsurface through weighted hoses to prevent aerial drift of the herbicide. GPS was used during the application to monitor boat speed and ensure a uniform distribution of the herbicide in each treatment area.

Weather during the treatment was optimal with an air temperature of approximately 65°F, 5-10 mph breeze from the west and 80%-100% cloud cover

A second “booster” application of Sonar was scheduled and performed on July 7th. Timing of the second application was guided by the collection of FasTEST samples that were analyzed by the SePRO Laboratory (the manufacturer of Sonar). Samples were periodically collected throughout the course of the treatment to monitor in-water concentrations of fluridone and insure that appropriate lethal concentrations were maintained for a minimum of 45-60 days. Monitoring of fluridone concentrations is paramount to the multi-year control of milfoil often possible with fluridone treatment.

FasTEST monitoring at Spy Pond in 2010 indicated that a lethal concentration (>6 ppb) of fluridone was maintained for at least 60 days. The average lake-wide concentration of fluridone was 6.5 ppb from 6/11 to 7/28/2010.



All treatments were completed by Aquatic Control's state certified applicators. Treatments were conducted in accordance with the product label directions and the permits issued by MA DEP and the Arlington Conservation Commissions. Each application proceeded smoothly and at no time during the course of this management program did we either observe or receive any reports of negative affect of treatment on fish, other aquatic life or wildlife.

Plant Response to Fluridone Treatment:

Post-treatment inspections of Spy Pond were performed on June 28th and August 5th to assess the results of the 2010 fluridone treatment program. During each inspection the littoral area of Spy Pond was toured by boat and vegetation was assessed visually using the help of an underwater camera and plant collection with a throw-rake.

6/28/10

- At the time of the first inspection (6/28) milfoil in the pond area was showing signs of treatment impact and growing tips were becoming chlorotic, a whitening caused by fluridone exposure.
- Growth of thin-leaf pondweed, waterweed and sago pondweed were observed and appeared healthy.
- No curlyleaf pondweed was found

8/5/09

- By the time of the second inspection on 8/5 nearly all of the milfoil had fallen out of the water column and what remained was decomposing on the bottom
- While large areas of the littoral area were barren with the absence of milfoil most of the native pondweeds appeared healthy.
- Sago Pondweed was the most abundant aquatic plant in the lake and while thinned, beds to the north and west of Elizabeth Island were still present.
- Coontail growth remained widespread but cover in most areas had been reduced significantly.

Late Season Survey:

A Late Season Vegetation Survey was performed on September 2nd. The entire lake was toured and vegetation was identified and spatially referenced. Again an AquaVu underwater camera and plant collection with a throw-rake were used to assist in the identification of vegetation.

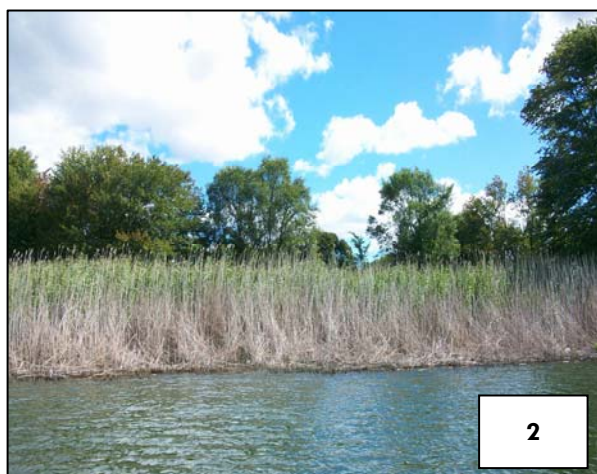
The post-treatment plant survey revealed that excellent control of milfoil had been attained throughout Spy Pond. Based upon our inspection, we believe that milfoil biomass (i.e. measured as the weight/unit area or height of milfoil in the water column) was reduced by >99% as compared to conditions observed in the pre-treatment survey. Reduction in bottom coverage of milfoil post-treatment (i.e. stem density) was also believed to be greater than 99%. Actually, no milfoil was observed during the post treatment inspection.

- Plant distribution was consistent with what was recorded during the spring and was generally confined to depths of less than 10 feet.
- Post-treatment plant cover was scant but was dominated by sago pondweed and coontail
- Occurrences of thin-leaf pondweed and waterweed were also recorded. Consistent with previous surveys, presence of these plants was typically found in the North Basin in some of the lower-density areas along the northeastern shoreline.
- A thin layer of filamentous algae cover most of the observed plant cover.
- Water clarity remained relatively high with a Secchi disk reading of 9.0 feet.

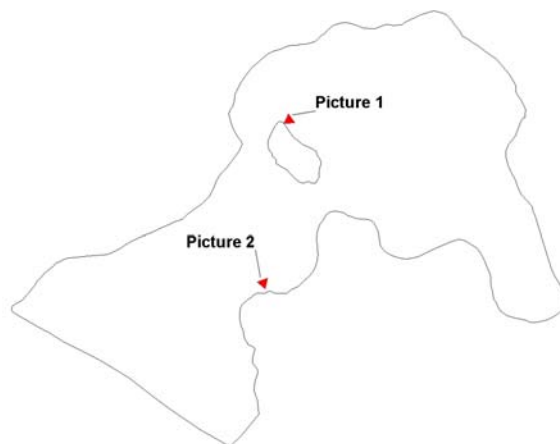
- Water temperatures ranged between 20.2°C (~68°F) and 10.2°C (~50°F) at the surface and at 10 meters, respectively (average = 17.8 °C)
- The thermocline was established and had moved to approximately 6 meters in depth
- Dissolved oxygen remained good above the thermocline with an average concentration of 7.8 mg/L to 6 meters. (approximately 90% saturation)
- Dissolved oxygen below the thermocline was <1.0mg/L. This is typical of a thermally stratified lake.

***Phragmites* Management**

Management of non-native, invasive *Phragmites* was initiated in 2009 when 29 individual stands were treated with glyphosate herbicide. Due to permitting limitations only *Phragmites* in standing water was treated in 2009. The treatment was very successful, controlling greater than 95% of targeted *Phragmites* plants. Little to no non-target impact was observed or reported following the 2009 treatment and adjacent vegetation was remained healthy.



- Picture 1: Dead *Phragmites* stalks surrounded by water willow and backed by green shrubbery on Elizabeth Island - 5/4/10.
- Picture 2 : Dead “in-water” *Phragmites* with healthy “land-based” *Phragmites* behind – Kelwyn Manor Park – 5/4/10



During the winter of 2009/2010 approval to treat “land based” *Phragmites* around the shoreline of Spy Pond was granted by the Arlington Conservation Commission. Treatment was performed as a continuation of the multi-year plan to control growth of this aggressive, non-native plant around the pond. While growth of *Phragmites* has been present at Spy Pond for some time, its continued spread both around the shoreline and into the lake prompted an effort to manage its growth and begin to restore the shoreline in favor of more beneficial native plant cover.

- Treatment of “land-based” *Phragmites* was performed on October 12th, 2010
- Treatment was conducted using AquaPro (glyphosate) herbicide and a non-ionic surfactant (Agri-dex).
- Treatment was performed with a combination of low-pressure/low-volume backpack sprayers and a boat mounted low pressure pump system and a low-pressure spray system mounted on an ARGO low-ground pressure all-terrain vehicle.
- The large *Phragmites* stand in Kelywn Manor Park was sprayed primarily from land and was accessed with the ARGO and sprayed with an on-board, low-pressure pump system fitted with a 200' hose.
- *Phragmites* stands elsewhere around the shoreline were sprayed with backpack sprayers outward from shore to ensure that only growth in standing water was targeted. Growth in deeper water or out-of-reach of the backpack sprayer was sprayed with a backpack from the boat. Permission to spray from shore was approved by most shoreline owners in a signed release form.
- The boat mounted pump system was only used to treat only the large *Phragmites* stand on the western shore of Elizabeth Island
- In total 27 individual *Phragmites* stands totaling approximately 1.1 acres were treated on 10/12/10.

Consistent with 2009, a pre-treatment survey of the shoreline, and of the proposed treatment areas, was conducted by Francis Clark of Carex Associates, to identify and mark any growth of Engleman's umbrella sedge (*Cyperus engelmannii*), an endangered shoreline plant know to grow around Spy Pond and protected by the Natural Heritage Endangered Species Program. The resulting survey report was submitted to the Department of Fisheries and Wildlife (Natural Heritage) for review prior to treatment. No treatment was performed in the vicinity of know occurrences of Engleman's umbrella sedge in 2010.

Recommendations for Ongoing Management

Following the whole-lake Sonar treatment performed at Spy Pond in 2010, it is likely that management of milfoil will not be needed for a few years. If milfoil growth does, however, begin to return in some of the more historically problematic areas it would be possible to spot-treat these areas with diquat (Reward) to maintain desirable cover of vegetation. Diquat has been used at Spy Pond on a number of occasions previously and has proven effective at providing excellent seasonal control of milfoil as well as coontail and sago pondweed, which have both been problematic at Spy Pond in the past.

Another potential option is spot treatment with triclopyr (Renovate OTF). Triclopyr is a systemic herbicide that can provide more lasting (2+ years) milfoil control than treatment with diquat. Triclopyr is an auxin mimic that targets dicot species like milfoil, preserving most native monocot species. The granular formulation of triclopyr, Renovate OTF, has been used at a number of waterbodies in the Northeast for selective control of Eurasian watermilfoil and results have been promising.

While effective, use of triclopyr can be cost-prohibitive and per acre treatment costs with Renovate OTF typically are more than three times the cost of treatment with Reward. Further, unlike diquat, triclopyr alone will not help suppress growth of coontail and sago pondweed. Because of the associated cost and limitations with regards to control of coontail and sago pondweed triclopyr is not recommended for Spy Pond at this time but should be considered in the future as management needs change.

Specifically for the 2011 season, we recommend the following invasive aquatic plant management efforts:

1. Early Season Vegetation Survey to assess milfoil growth and finalize 2011 treatment needs (if any).
2. (Contingency) Early season treatment with diquat (up to 15 acres) for the control of milfoil re-growth.
3. Treatment of *Phragmites* re-growth (as necessary) with glyphosate herbicide (late Aug-mid October)
4. Late Season Vegetation Survey to document year after treatment vegetation conditions and provide recommendations for continued management

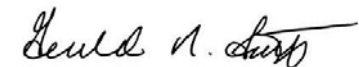
Based on the above tasks we would recommend a budget of \$2,000 for early and late season vegetation surveys in 2011. We would also recommend that the Town budget an additional \$7,500 for contingency treatment of nuisance milfoil, coontail or sago pondweed re-growth, if necessary.

We understand that funding for *Phragmites* management is independent from the Town, but recommend a minimum of \$2,000 for follow-up spot-treatment.

We look forward continuing our work with the Town of Arlington with towards lake management goals. If you have any questions, please do not hesitate to contact us.

Sincerely,

Aquatic Control Technology, Inc.



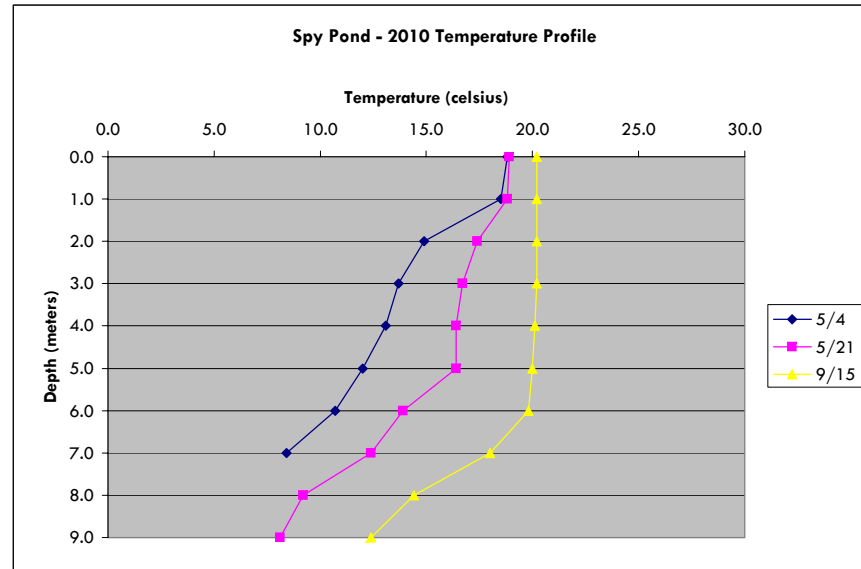
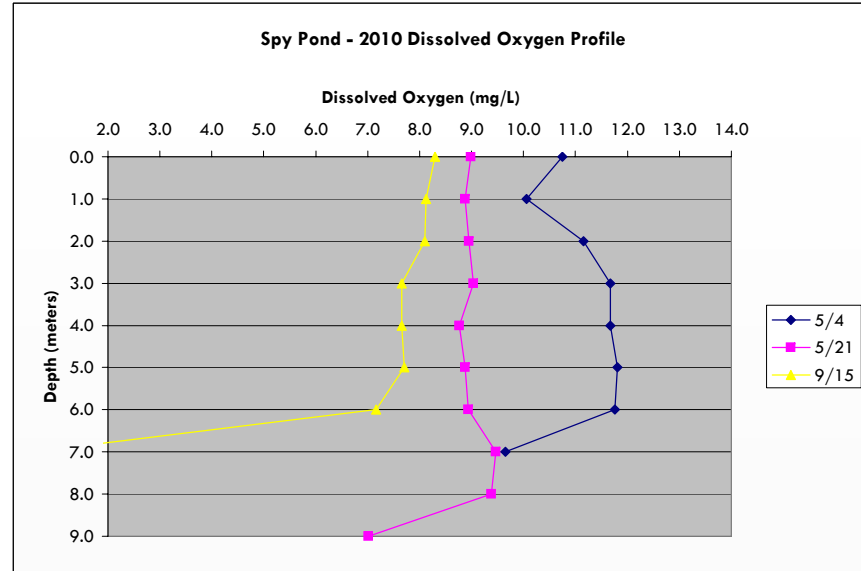
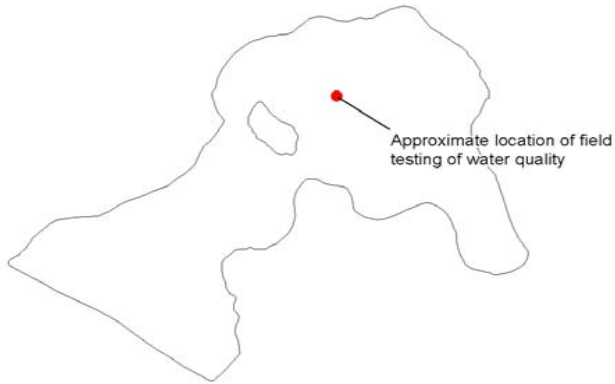
Gerald N. Smith
President/Aquatic Biologist



Michael Lennon
Biologist

2010
Temperature/Dissolved Oxygen Profiles For Spy Pond - Arlington, MA

	5/4		5/21		9/15	
Depth (m)	Temp. (C)	D.O. (mg/l)	Temp. (C)	D.O. (mg/l)	Temp. (C)	D.O. (mg/l)
Surface	18.8	10.75	18.9	8.98	20.2	8.29
1.0	18.5	10.06	18.8	8.88	20.2	8.12
2.0	14.9	11.16	17.4	8.95	20.2	8.10
3.0	13.7	11.67	16.7	9.04	20.2	7.66
4.0	13.1	11.67	16.4	8.76	20.1	7.65
5.0	12.0	11.81	16.4	8.88	20.0	7.71
6.0	10.7	11.76	13.9	8.94	19.8	7.16
7.0	8.4	9.65	12.4	9.47	18.0	0.56
8.0			9.2	9.38	14.4	0.57
9.0			8.1	7.01	12.4	0.57
10.0					10.2	0.59





Chain of Custody 2672C162-9

Customer Company

Company Name: Aquatic Control Technology, Inc.
Address: 11 John Road
City: Sutton
State: MA 01590-2509

Customer Contact

Contact Person: Gerald N
E-mail Address: gnsmith@aquaticcontroltech.com
Phone:
Fax:

Payment Information

Payment Type: Invoice
Card Number/Expiration Num:

Waterbody Information

Waterbody: Spy Pond
Waterbody Size (acres): 90.00
Depth Average: 0.00
Target Plants Eurasian Watermilfoil,

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Sample Location	Products	Acres Treated	Rate	Active	Result
west basin	06/01/2010	06/11/2010		Sonar A.S.	90	10	Fluridone	10.3 ppb
east basin	06/01/2010	06/11/2010		Sonar A.S.	90	10	Fluridone	6.6 ppb

Laboratory Information

Date Received: 6/15/2010
Date Results Sent: 6/16/2010
Date Analysis Performed: 6/16/2010
Storage Conditions Analyzed Immediately



Chain of Custody 6277EE38-0

Customer Company

Company Name: Aquatic Control Technology, Inc.
Address: 11 John Road
City: Sutton
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Customer Contact

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E-mail Address: gnsmith@aquaticcontroltech.com
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Fax:

Payment Information

Payment Type: Invoice
Card Number/Expiration Num:

Waterbody Information

Waterbody: Spy Pond
Waterbody Size (acres): 90.00
Depth Average: 0.00
Target Plants Eurasian Watermilfoil,

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Sample Location	Products	Acres Treated	Rate	Active	Result
east basin	06/01/2010	06/29/2010		Sonar A.S.	90	10	Fluridone	6.0 ppb
west basin	06/01/2010	06/29/2010		Sonar A.S.	90	10	Fluridone	5.2 ppb

Laboratory Information

Date Received: 7/1/2010
Date Results Sent: 7/2/2010
Date Analysis Performed: 7/2/2010
Storage Conditions Analyzed Immediately



Chain of Custody 5E7829CF-A

Customer Company

Company Name: Aquatic Control Technology, Inc.
Address: 11 John Road
City: Sutton
State: MA 01590-2509

Customer Contact

Contact Person: Gerald N
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Phone:
Fax:

Payment Information

Payment Type: Invoice Card Number/Expiration Num:

Waterbody Information

Waterbody: Spy Pond Waterbody Size (acres): 90.00
Depth Average: 0.00
Target Plants Eurasian Watermilfoil,

Sample Information

Sample Site ID	Date Treated	Date Sample Collected	Sample Location	Products	Acres Treated	Rate	Active	Result
east basin	07/07/2010	07/28/2010		Sonar A.S.	90	10	Fluridone	5.2 ppb
west basin	07/07/2010	07/28/2010		Sonar A.S.	90	10	Fluridone	4.9 ppb

Laboratory Information

Date Received: 8/2/2010 Date Analysis Performed: 8/2/2010
Date Results Sent: 8/2/2010 Storage Conditions Analyzed Immediately